## Snapshot of 2023 CASTNET Data

The Clean Air Status and Trends Network (CASTNET) is a cross-agency, multipollutant air quality network led by EPA. The network provides data to support federal and state monitoring requirements, characterize regional and global transport of air pollutants, and assess long-term air quality trends. Monitoring sites are located primarily in rural areas across the United States filling critical spatial gaps in the nation's air quality network. EPA operates many of the sites and coordinates overall management and operation of the network along with partners in several federal, state, and tribal agencies, including, the National Park Service (NPS), the Bureau of Land Management, and the U.S. Forest Service (USFS), in cooperation with tribal nations, and state environmental agencies. This coordination serves to maintain a consistent data record to assess long-term trends, while also evolving to address new priorities and emerging data needs. This snapshot provides the latest data and highlights from 2023, including maps and trends developed from CASTNET measurements collected through 2023. Additional maps and graphs are available on the CASTNET website: https://www.epa.gov/castnet/.

Key Network Highlights from 2023

- In January 2023, the La Posta CASTNET site (LPO010) was installed in southern California. The site is a small footprint site (no walk-in shelter) operated by the La Posta Tribe of Diegueño Mission Indians.
- The Elk Island National Park site in Alberta, Canada (ALB801) has been operating as a CASTNET-protocol site since 2019. The site officially joined the CASTNET network in March 2023.
- Due to staff shortages, the Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas discontinued sampling at the KIC003 CASTNET site in July 2023. This site had been operating since 2014.
- The NPS decommissioned the Petrified Forest National Monument, AZ (PET427) site at the end of 2023 after cultural artifacts were discovered near the monitoring site.
- The Woodstock, NH (WST109) CASTNET site, located within the Hubbard Brook Experimental Forest, was suspended in May 2022. In October 2023, the USFS established an agreement with EPA to provide in-kind support to operate and maintain the monitoring site and sampling resumed.
- The NPS discontinued filter pack sampling at the Wind Cave National Park, SD (WNC429) CASTNET site in 2023 due to resource constraints.
- EPA suspended operations at several sites in 2022 to allow the Agency to reassess programmatic needs. Operations at seven CASTNET sites remained suspended during 2023.

Figure 1 provides a map of the sites that operated during 2023. A detailed description of sites and measurements from each location can be found on the EPA CASTNET site page (https://www.epa.gov/castnet/castnet-site-locations)

Figure 1. 2023 CASTNET Sites
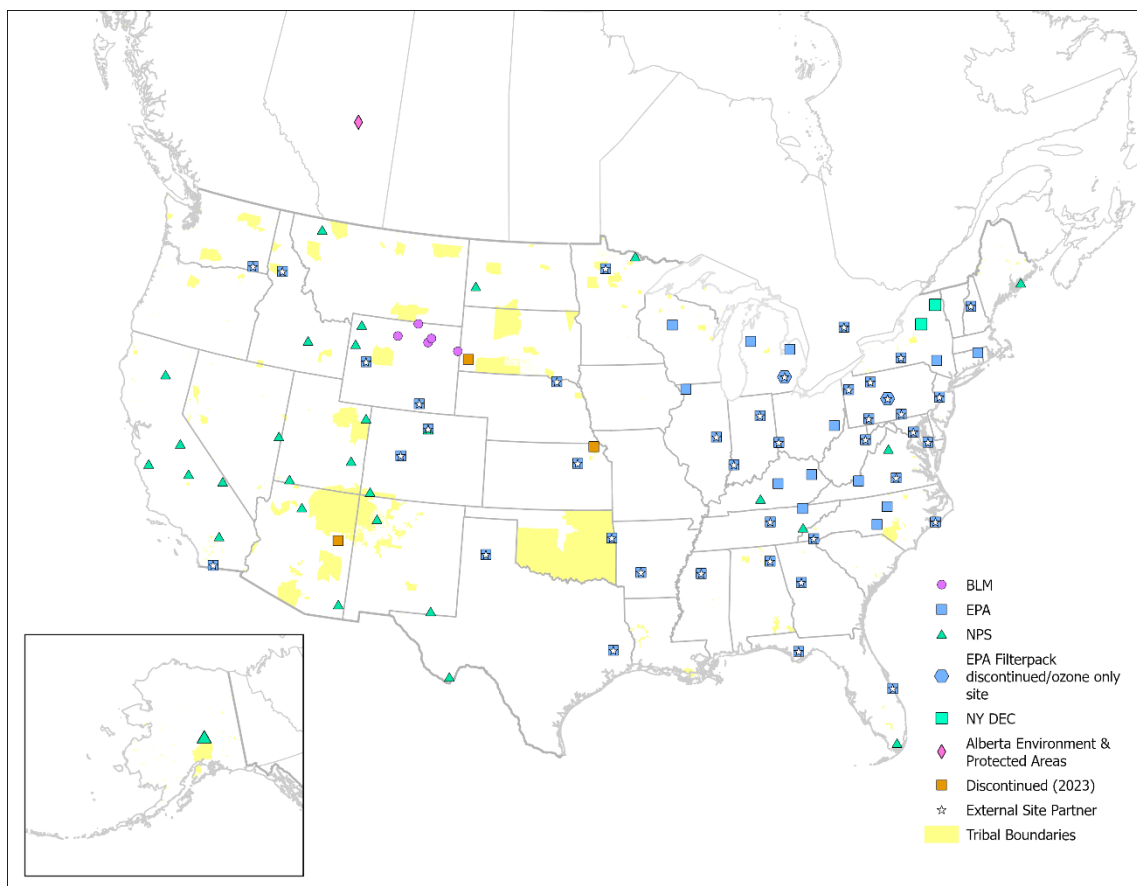
Air Quality Results Through 2023

Regional air pollution has significantly declined through federal, state, and local control programs to reduce sulfur dioxide (SO_2) and nitrogen oxide (NO_x) emissions (e.g., trends in emissions from electric generating units: https://www.epa.gov/power-sector/progress-report-emissions-reductions) and have contributed to the significant improvements in air quality. The figures below highlight these changes through 2023.

Ozone

Trends in O_3 concentrations from the eastern and western reference sites are shown in Figure 2. The existing primary and secondary National Ambient Air Quality Standards (NAAQS) for O_3, established in 2015, are 0.070 parts per million (ppm). To determine compliance with the NAAQS a design value is calculated using measured O_3 concentrations. The design value is reported as the fourth highest

daily maximum 8-hour concentration (DM8A) averaged across three consecutive years. The median fourth highest DM8A O_3 concentration for 2023 at the eastern CASTNET reference sites was 67 parts per billion (ppb). At the western CASTNET reference sites, the median fourth highest DM8A was 65 ppb. The most recent three-year period for calculated design values (2021–2023), resulted in several locations at or above the O_3 NAAQS (Table 1).

Figure 2. Annual Trend in the Daily Maximum Rolling 8-hour Average O_3 Concentrations from Western (left) and Eastern (right) CASTNET Sites
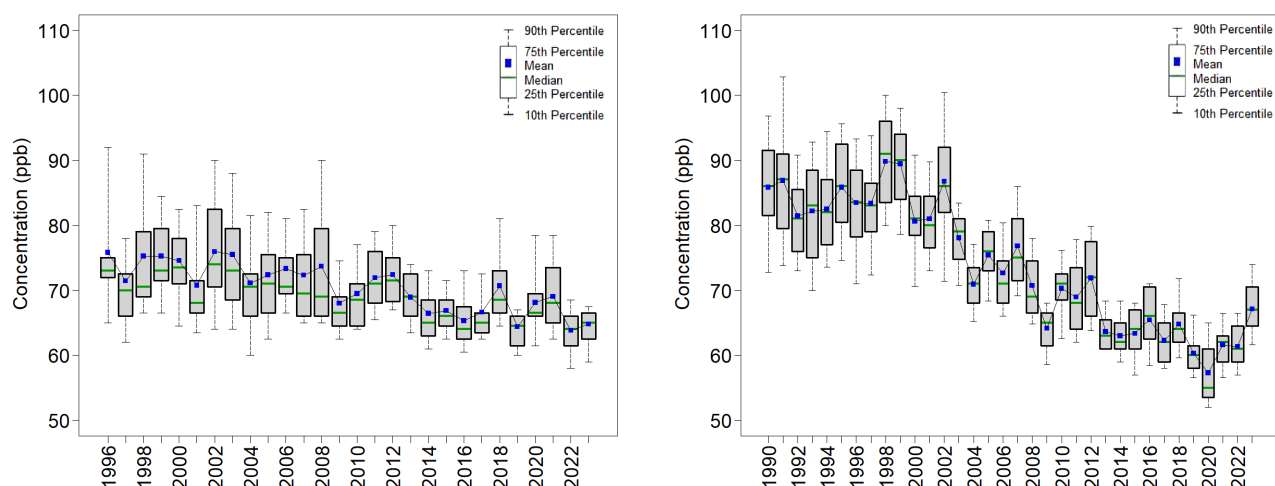

Table 1. CASTNET Site Locations with 2021–2023 O_3 Design Values Equal to or Greater Than the 2015 O_3 NAAQS

Site ID	Site Name	State	Ozone Design Value
CAV436	Carlsbad Caverns National Park	NM	78 ppb
DEV412	Death Valley National Park	CA	71 ppb
DIN431	Dinosaur National Monument	UT	76 ppb
JOT403	Joshua Tree National Park	CA	79 ppb
ROM406	Rocky Mountain National Park	CO	70 ppb
SAN189	Santee Sioux Tribe	NE	71 ppb
SEK430	Sequoia and Kings Canyon National Park	CA	88 ppb
YOS404	Yosemite National Park	CA	72 ppb

Filter Pack Trends

Filter pack measurements help identify trends in concentrations. Long-term trends in the eastern and western United States are shown in Figure 3. The percent change in average concentrations of O_3, total NO_3^-, SO_4^{2-}, and NH_4^+ from 1996 through 2023 for the western sites and 1990 through 2023 for the

eastern sites is shown in Table 2. Significant reductions in air pollution have been realized throughout the United States. Trends from each monitoring location can be found on the individual CASTNET site pages (https://www.epa.gov/castnet/castnet-site-locations).

Table 2. Average Concentrations and Percent Changes Realized at Western and Eastern CASTNET sites.

Pollutant	Western Reference Sites		Eastern Reference Sites		Percent Changed	
	1996–1998	2021–2023	1990–1992	2021–2023	West	East
4th Highest DM8A O_3 Concentration (ppb)	74	66	85	63	-11	-25
Total NO_3^- (µg/m^3)	1.0	0.6	3.0	1.2	-40	-59
SO_4^{2-} (µg/m^3)	0.8	0.5	5.4	0.9	-42	-83
NH_4^+ (µg/m^3)	0.3	0.2	1.8	0.4	-41	-77

Note: Reference sites are long-term sites that have a consistent data record over the defined period.

Figure 1. Trends in Concentrations from CASTNET Filter Pack Sites located in the Western (1996–2023) and Eastern (1990–2023) United States
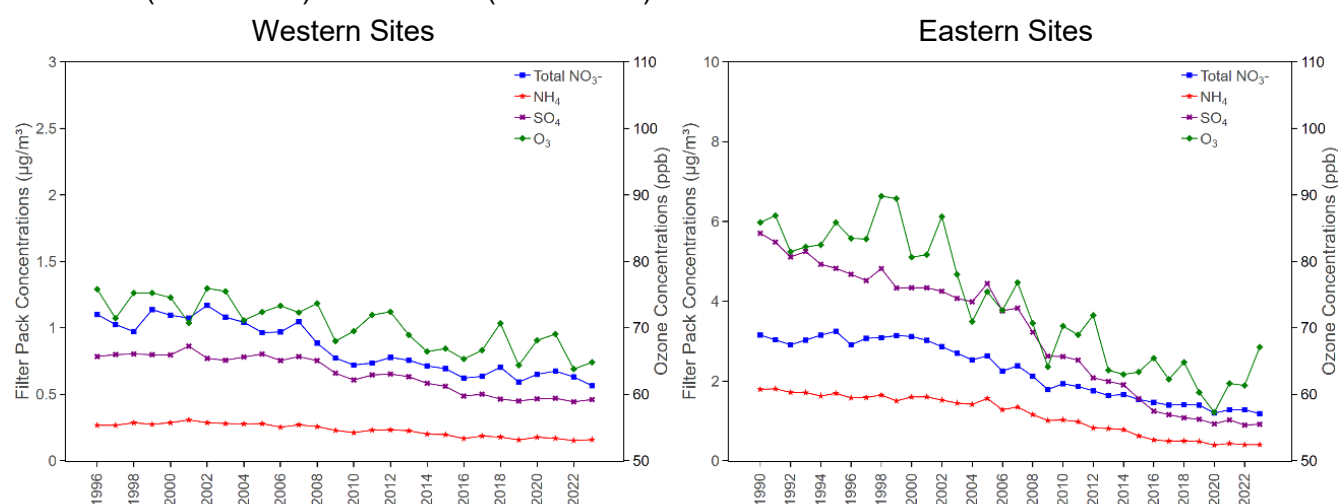
Note: The y-axes are on different scales.

Concentration and Deposition Maps from 2023

The regionally distributed CASTNET sites provide air quality information between urban areas where most state and local monitors are placed. Filling these "gaps" and measuring the spatial gradients provide important insight into how interstate and international pollution impacts rural and upwind communities. A series of concentration maps can be found on the CASTNET website here: https://www.epa.gov/castnet/maps-charts.

CASTNET is the primary source of data used to estimate dry and total (wet + dry) atmospheric deposition of pollutants. Deposition represents the amount of pollution reaching the surface (e.g., water bodies, forests, crops, etc.). The deposition amount is used to evaluate if an aquatic system or species is likely to be protected at that level of air pollution. This is known as a critical load. CASTNET reports annual trends in atmospheric deposition using a measurement-model fusion technique. For detailed information on calculating atmospheric deposition, visit the National Atmospheric Deposition Program (NADP) Total Deposition Science Committee (TDep) website (nadp.slh.wisc.edu/committees/tdep/), and for more information on critical loads visit the NADP Critical Loads of Atmospheric Deposition (CLAD) website (nadp.slh.wisc.edu/committees/clad/).

Maps of ambient concentrations of SO_4^{2-} from 2000–2002 and 2021–2023 are shown in Figure 4, and maps of total nitrogen deposition over the same time periods are shown in Figure 5. These are examples of the individual maps provided on the website.

Figure 2. Ambient Concentrations of SO_4^{2-} as Measured at CASTNET Sites from 2000–2002 (left) and 2021–2023 (right)
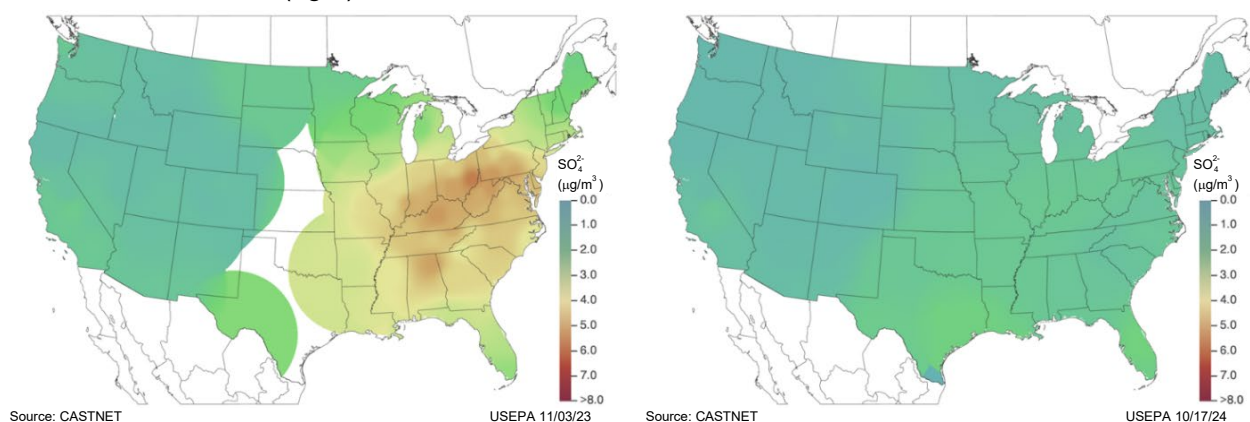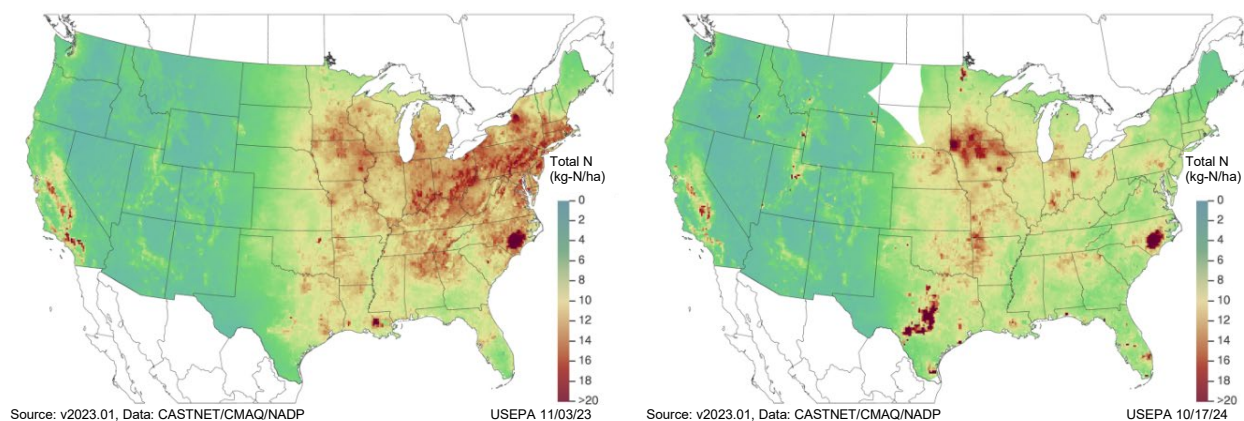

Figure 5. Total (Wet + Dry) Atmospheric Nitrogen Deposition from 2000–2002 (left) and 2021–2023 (right)

Over the past three decades (1990–2023), air quality across the United States has improved significantly. CASTNET remains a vital tool for regulatory programs, providing transparent data to monitor changes in air pollution and assess environmental impacts. By tracking trends in air quality, CASTNET helps ensure accountability and supports ongoing efforts to protect public health and ecosystems.

Additional Resources

EPA routinely updates the CASTNET website with new information and data summaries. For more details on the program visit the resources provided below:

CASTNET homepage: https://www.epa.gov/castnet
CASTNET locations with links to site data: https://www.epa.gov/castnet/castnet-site-locations
Annual maps: https://www.epa.gov/castnet/maps-charts
Summary reports and quality assurance information: https://www.epa.gov/castnet/documents-reports
EPA's air monitoring programs: https://www.epa.gov/amtic

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